



# Feasibility Assessment for a Los Angeles Field Study

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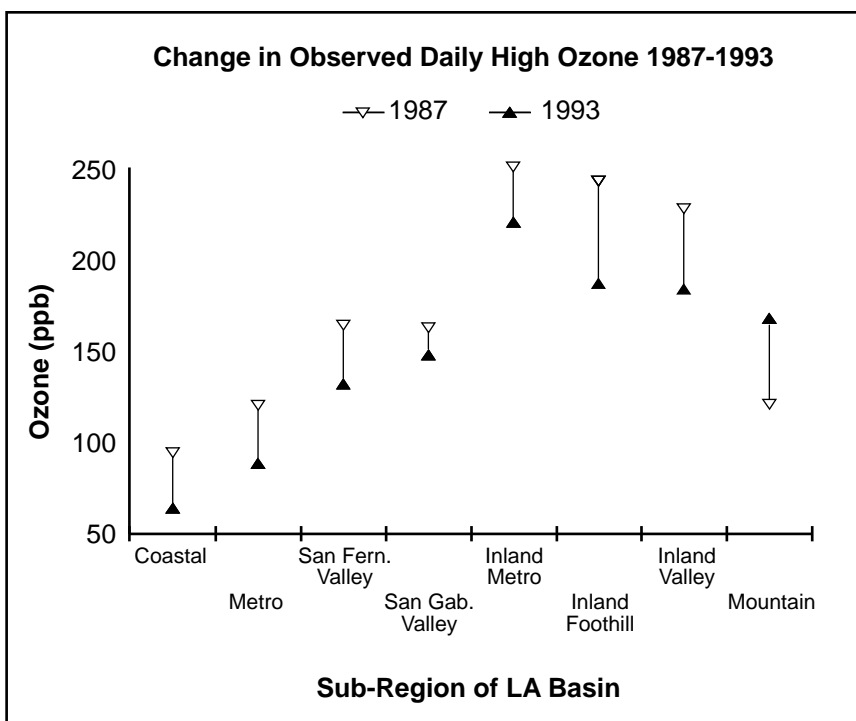
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## Objective

To determine whether a major field study of air quality and meteorology in Los Angeles could answer the following two questions: (1) Do current air quality models (such as the Urban Airshed Model [UAM]) reproduce the changes in ozone air quality observed in Los Angeles over the last decade? and (2) Could current measurement techniques observe a step-change in ambient pollutant concentrations resulting from the introduction of Phase 2 California reformulated gasoline (RFG) in March of 1996?



## Approach

The approach to answering both questions was to quantitatively estimate the relevant "signals" and "noise," and then use statistical methods to estimate whether the signal will be discernible.

For question 1, a pilot evaluation was performed with data available for 1987 and 1993. Groups of meteorologically similar high ozone days in 1987 and 1993 were identified to determine how episodic ozone levels have changed. At the same time the UAM was used to model the predicted ozone changes over this same time period. The observed and predicted changes were compared for agreement or disagreement within the combined uncertainties.

For question 2, the regulatory emission factor models and emission inventory projections were used to estimate how the change in gasoline formulation will alter emissions of specific pollutants and ratios of pollutants (indicators). Other emission changes expected in the

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same time frame that may confound the RFG signal were also identified and quantified.

The result was a target list of the most promising indicators for the RFG change. Recent databases of pollutant measurements in Los Angeles were reviewed to estimate what magnitude change could be detected for each identified indicator, and this threshold was compared to the predicted change.

## Accomplishments

The feasibility study showed that a new field study could address both issues and demonstrated the application of a novel approach to answering question 1. This approach was made possible by the development of a new method for identifying similar ozone episodes in different years based on agglomerative hierarchical clustering of key meteorological variables. This method provided the trends in episodic ozone for comparison with model predictions. The method also showed subregional variations in the ozone trends for different areas of the basin (see figure). Largely because of wide uncertainty bands for the model predicted change, the observed and predicted ozone trends were not statistically different. For question 2, the changes in emissions of criteria pollutants (HC, CO, and NO<sub>x</sub>) were projected to be too small to be observed (relative to measurement variability and other confounding factors). However, several VOC species and species ratios were identified for which there may be a discernable signature when California Phase 2 RFG is introduced. The conclusions of the feasibility study and the information compiled will be available to help guide the planning of Los Angeles field study.

## Future Direction

The clustering method developed for identifying similar episode days across multiple years shows great promise for further development. Potential applications include evaluating ozone trends, identifying ozone episode types, comparing trends for different episode types, and investigating the return times of episodes. The application to Los Angeles should be refined and extended to include the most recent data. Applications should be developed for other metropolitan areas with high ozone, particularly in the northeastern U.S. The method should be applied equally to pollutants other than ozone, such as PM-2.5 or PM-10.

## Publications

Fujita, E.M. (1995). "Ambient Versus Emission Inventory NMHC, CO, NO<sub>x</sub> Trends in the South Coast Air Basin (1987–1993)," presented at the 88th Annual Meeting of the Air and Waste Management Association, San Antonio, TX (June). Paper 95-RP113B.01.

Main, H.H., P.T. Roberts, and M.P. Ligocki. (1995). "Assessing the Usefulness of VOC Data as Indicators of Change in Fuel Composition in the South Coast Air Basin (California)," presented at the 88th Annual Meeting of the Air and Waste Management Association, San Antonio, TX (June). Paper 95-RA113A.06.

Stoeckenius, T.E. J.P. Cohen, and S.B. Shepard. (1995). "A Clustering Method for Identifying Ozone Episodes with Similar Meteorological Conditions: Application to Model Evaluation and Trend Analysis in the South Coast (Los Angeles) Air Basin," presented at the 88th Annual Meeting of the Air and Waste Management Association, San Antonio, TX (June). Paper 95-FA113C.01.

Yarwood, G., T.E. Stoeckenius, and R.E. Looker. (1995). "Modeling the Change in Episodic Ozone between 1987 and 1993 in the South Coast (Los Angeles) Air Basin," presented at the 88th Annual Meeting of the Air and Waste Management Association, San Antonio, TX (June). Paper 95-RA113A.06.